Post-print version of the paper by Hussein et al. In proceedings of 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS), Metz, France, 2019, pp. 933-937. **DOI:** 10.1109/IDAACS.2019.8924296

Evaluating the Impact of Involving Students in Producing Learning Aids in Project Management. The Animation Project

Bassam Hussein[1], Carsten Wolff [2], Nargiza Mikhridinova[2]
[1] The Norwegian University of Science and Technology (NTNU), Trondheim. Norway.
[2] Dortmund University of Applied Sciences And Art. Dortmund. Germany

***Abstract*—The purpose of this paper is to present the preliminary findings from implementing and evaluating a project-based learning example (The Animation Project). The idea of the project is to involve the students in producing learning aids in project management in the form of video animations of real-life project cases. This was done to create an authentic project experience of actual projects that has solutions that potentially could be implemented. The preliminary findings suggest that the project adequately satisfied its intended objectives, in particular, the project provided students with an opportunity to understand and relate better to various project management concepts. Results also suggest that involving students in authentic project assignments may have positive impact on motivation and dedication in the project.**

Keywords—Animation project; project management; problem-based learning; project-based learning; student involvement.

I. INTRODUCTION

Reported literature on efforts to improve project management education can be classified into two main streams. One stream is focusing on identifying type of skills and knowledge and other competencies that project practitioners should have in order to be able to manage projects or to manage changes brought by projects [1-5]. The second stream is looking into suitable instructional methods and modes of delivery to facilitate developing the skills needed to achieve that purpose [6-10]. Among the instructional methods that has been suggested to teach project management is Project or Problem-based learning (PBL) [11-13]. PBL is a model that organizes learning around projects [14]. PBL incorporates real-life challenges where the focus is on authentic (not simulated) problems or questions and where solutions have the potential to be implemented. The advantages of this approach can be summarized as follows [14];

- The method gives the students the opportunity to get familiar with the type of practical problems that faces project organizations in real situations.
- Provides the students with hands-on experiences on how to handle these problems most effectively.
- Offers the students the valuable experience of working in teams. And providing students with a learning experience that is superior to isolated experiences targeting the individual.

PBL is an instructional method where relevant problems are introduced at the beginning of the instruction cycle and used to provide the context and motivation for the learning that follows. In addition, PBL typically involves significant amounts of self-directed learning on the part of the students [15].

The purpose of this paper is to present the preliminary findings from implementing a project-based learning case (The Animation Project) that has been used in an introductory course in project management at the Norwegian University of Science and Technology as a part of the European master program in project management EuroMPM. The students attending the course have negligible or no prior training in project management methods or techniques. We believe that the case covered in this paper is different because it has been developed with the primary objective of involving students to produce usable learning aids in project management. The experiences from this example could therefore be useful for teachers who wants to initiate similar initiatives. The paper provides a description of the implemented case (The Animation Project) and then presents the results of evaluating the effectiveness of the method in terms of its ability to engage the students and in its ability to provide students with sound and authentic project management experience.

II. THE ANIMATION PROJECT

Students attending the introductory course in project management are instructed to collaborate on a group-based assignment called the Animation Project. The project is mainly student driven with little interference from the instructor and incorporate student autonomy, unsupervised work time, and student responsibility. An overview of the other instructional methods used in this introductory course can be reviewed in [6]. The assignment is conducted in self-enrolled groups of 4-6 students and the task given to each

Post-print version of the paper by Hussein et al. In proceedings of 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS), Metz, France, 2019, pp. 933-937. **DOI:** 10.1109/IDAACS.2019.8924296

group is to produce a short video about a real-life project case. Students are permitted to use any real life case but are encouraged to base the animation on one of the cases described in the text book used in the subject [16]. Excerpts from a sample case is shown in Box 1.

The students are then instructed to establish a comprehensive project plan, develop and produce a short video/animation (4-5 minutes) that provides a summary of the case. This should include; the challenges encountered, the root causes of these challenges, efforts that has been implemented by the project manager and the team to respond to these challenges and finally useful and transferable insights gained from the project case.

The assignment is based on real and factual case; therefore, it gives the feel of authenticity to students. The characteristics of authenticity include the topic, the task given, the roles that students play, the context within which the work of the project is carried out, the product that are produced by the project, the audience for the project's product. Therefore, the assignment provides a real-life challenge and not only an academic challenge. This is in line with recommendation put by Gordon [17] who makes the distinction between academic challenges, scenario challenges, and real-life challenges.

Regional Hospital H was facing major economic challenges, and had to reduce spending on salaries. Several initiatives were suggested. One of these initiatives was introducing speech recognition software. By using this type of software, a doctor can 'talk' to a computer and his or her speech will be converted into written form in the electronic patient record (EPR) system. Previously, the doctors had audiotaped their notes relating to their patients, and then secretaries had transcribed the notes into the hospital's records. The objective was to introduce the speech recognition software without causing any increase in the doctors' time spent on documentation. It was assumed that doctors who used speech recognition software would spend longer on dictations, but would not subsequently check and approve the records. With the speech recognition system, all activities were to be carried out there and then, and the record would be approved immediately. All doctors took a three-day course, and thereafter, in principle, all records that hitherto had been dictated by them and then transcribed by secretaries would immediately become accessible in text format. The hospital's management had already estimated that a significant number of secretary work years could be saved. A central typing service was created, and it was planned that the transcription of any remaining dictations was to be done there. This would streamline the typing process and simultaneously be an outcome measure of how well the speech recognition system had been implemented.

Dictation errors

The time doctors spent on managing their records on paper prior to the introduction of the system was estimated as 4.5 hours per week on average. During the pilot study of the speech recognition software the time spent on records management, including checking them, was estimated as zero. This proved to be an inaccurate estimate. When the secretaries transcribed records, they sometimes discovered errors that needed to be checked by the doctor concerned, but such errors were generally easy to spot, and usually it was possible to understand what the doctor had intended to say, despite the errors. The introduction of the speech recognition system led to the emergence of entirely new errors that often could change the meaning of the text completely. Such errors proved to be difficult to discover during proofreading, since the software spelt all words correctly and the sentence structure seemed plausible. The doctors considered the errors very unfortunate and potentially risk-filled, and therefore they had to spend an inordinate amount of time on checking their patients' records. Extra time was not set aside in connection with the implementation of the system, and the doctors still had only 20 minutes per patient, which included maintenance of their records and correcting their notes. Consequently, many doctors stopped using the software. However, secretarial staff continued to be downsized, and doctors were more or less forbidden to return to dictaphones. By the time the doctors had discovered that they were only able to use the system to a limited extent compared with what had been planned, the damage had already been done – the secretaries had left. There had been early warnings from the doctors that the use of the speech recognition software could result in the risk errors. This feedback on the project was not considered and instead explained as due to technical problems and inadequate training. Risk and vulnerability (RAV) analyses were carried out, but the results were only considered to a small extent. Better communication with the 'end users' could have helped to identify the problems clearly in the early stages so that mitigation measures could have been taken, and possibly the project might have been reconsidered. Although the project reduced the numbers of employees as required, an unforeseen consequence was that the hospital's doctors had to type more than half of all patient records. Hence, they had considerably more administrative tasks relating to patient care. This was an unintended and negative result of the project, which contributed to reduced efficiency in the 'production' process, which was the doctors' responsibility.

Box 1. Excerpts from a real-life project case: Introducing speech recognition software. (Hussein, 2018 pp 195-201)

III. Objectives of the Animation Project

The Animation Project has two sets of objectives. One objective is related to the final product of the project. The goal is to have a product that has the potential to be used by other students as a learning aid in order to help them gain better understanding of the challenges encountered in the real-life project.

The second set of objectives is related to the process of working on the animation project where learning occurs.

A. Objective Related to the Final Product

The final product of the animation project is an animation or a short video of a real life and factual project case. Students are free to decide on what project case they intend to animate. They are free as well to select what type of final product they intend to produce (animation, video, still images with sound track or combination of several

Post-print version of the paper by Hussein et al. In proceedings of 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS), Metz, France, 2019, pp. 933-937. **DOI:** 10.1109/IDAACS.2019.8924296

approaches). An example of these produced animations for the real life case (Introducing speech recognition software) that was shown in Text Box 1 can be viewed at https://www.youtube.com/watch?v=GSIxFBsyeR0. The goal of producing these animations is to use them as a learning aid in forthcoming courses in order to facilitate understanding of the problems or challenges encountered in these case studies rather than relying on verbal or linguistic approach. Numerous research studies have shown that using videos to be greatly beneficial to students' academic performance [18]. It has also been suggested by Cruse [19] that teaching methods that include the use of video and audio provide more opportunities for learning. Therefore, it is expected that these animations will contribute to higher retention level among students who will be taking the subject. In addition, the authors believe that engaging students in such assignment should provide a higher motivational factor compared to other instructional methods. The author's assumption that is related to the final product and will be assessed in this paper is:

- Knowing that the results of the animation project will be made available to other students as a learning aid in project management should motivate the students to perceive the project as authentic and thus gives them motivation to exert more effort.

B. *Objectives Related to the Process*

The second set of objectives of the animation project is related to the process of working on the project as a method for PBL. The animation project is aiming at providing students with a challenge that helps them to learn the central concepts of the discipline via the project. *One central issue that the project* focuses is the importance of considering that success in projects is multidimensional construct and that it is important to manage projects with both the output (deliverables) and outcome (the expected benefits of the project) in mind. The assignment therefore is an attempt to encapsulate the entire project life cycle. This is in line with recommendation by Blumenfeld, et al. [20] that all the activities should be designed to achieve an important intellectual purpose. Our assumptions that is related to the process and will be assessed in this paper is as follows:

- The Animation Project will help students to realize the importance of considering both the output (the deliverables) and the outcome (the impact) when working on projects
- The Animation Project should provide students with first-hand experience on how to manage projects that might be benefitable in the future.

The project was as well initiated to allow students to conduct a constructive investigation with clear goal that has a final product that required inquiry, knowledge building, and decision-making. Figure II shows an overview over the tasks and activities that should be completed in order to complete the assignment. These tasks and activities required to achieve the goal of the project requires new understandings as well as project management skills on the part of students [21]. Completing this investigation should therefore contribute to:

- Better relate to various project management methods that are needed to complete the assignment. Including, risk management, time planning, project organizing, role of soft factors in project management and managing stakeholders' expectations
- Working on the animation project should provide students with better insights into the causes of challenges and lessons learned from the real-life cases

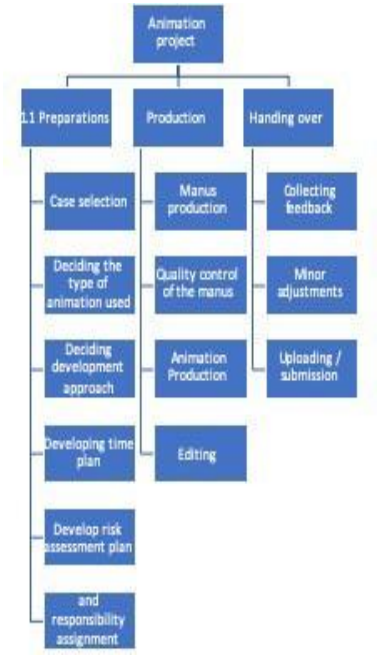

Figure 1. Activities involved in the animation project

IV. METHODOLOGY

The instrument used to evaluate the above-mentioned objectives was an anonymous questionnaire that was distributed to students at the end of the semester. Students were asked to assess their degree of support to the following statements:

OB1 Knowing that the results of the animation project will be made available to other students as a learning aid in project management has motivated me to put an extra effort.

OB2 The Animation Project helped me to realize the importance of considering both the output (the deliverables) and the outcome (the impact) when working on projects.

OB3 The Animation project gave me an opportunity to understand and relate better various project management methods that are needed to complete the assignment.

OB4 I will be able to manage my projects in the future because of the experience I gained in the Animation project.

Post-print version of the paper by Hussein et al. In proceedings of 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS), Metz, France, 2019, pp. 933-937. **DOI:** 10.1109/IDAACS.2019.8924296

OB5 Working on the animation project provided me with better insights into the causes of challenges and lessons learned from the real-life case.

The scale used to assess the degree of support to each objective was from 1 to 5. Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1). The instrument was administered to the students taking the subject in Spring semester 2019 and 45 students have delivered valid responses. All data was then exported to a software package SPSS in order to analyse the results. We use in this paper simple T-test and percentage analyses in order to comment on the findings.

V. FINDINGS

The results of the T-test, the mean, and the mode of student's responses are shown in Table I.

TABLE I. T-TEST, P-VALUE AND MEAN OF STUDENT RESPONSES

	T=3	p-value	Mean	Evaluation
OB1	0.94	.351	3.18	Adequate support
OB2	.86	.391	3.13	Marginal support
OB3	2.19	.034	3.33	Good support
OB4	-.683	.499	2.89	No support
OB5	2.72	.009	3.38	Very good support

The results of the statistical tests show marginal support for OB2. Only 44.4% of the students Strongly Agree or Agree to this statement while 35% strongly Disagree or Disagree to the statement as shown on Figure 2. This result may suggest that more supervision and feedback from the course supervisor is needed to help students encapsulate the knowledge they gain while they are working on the project with the generic project life cycle.

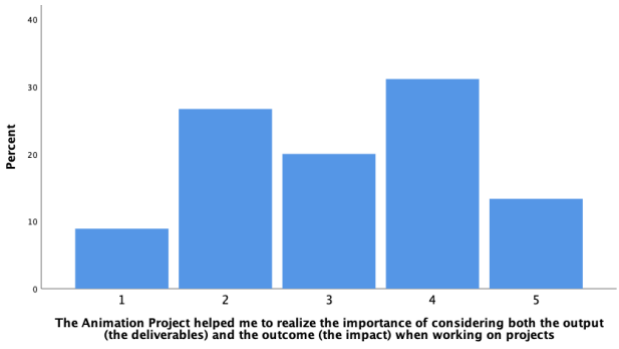

Figure 2. The distribution of student response to OB2

The results of the statistical tests show adequate support for OB1. Results show that 44.5% of the students Strongly Agree or Agree that the Animation project satisfies this objective while only 26,7% Strongly Disagree or Disagree as shown in Figure 3. The authors believe that this is an encouraging result and affirm the need for involving students with project that results in solutions that could be actually implemented or used by others provides more motivation on the part of students.

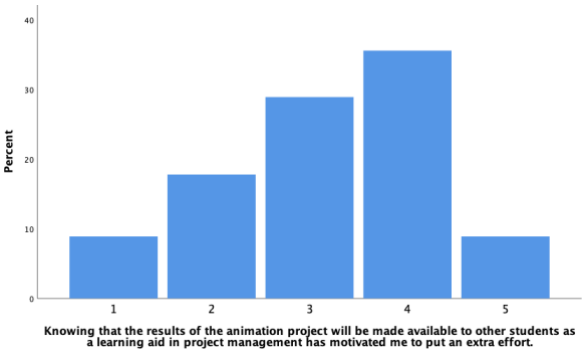

Figure 3. The distribution of student response to OB1

The results of the statistical tests show good support for OB3 as shown in Figure 4. Results show that 49% of students either Agree or Strongly agree to the statement while only 26,6 % Disagree or strongly disagree to the statement. This result affirm that the animation project contributed to gaining understanding of project management concepts.

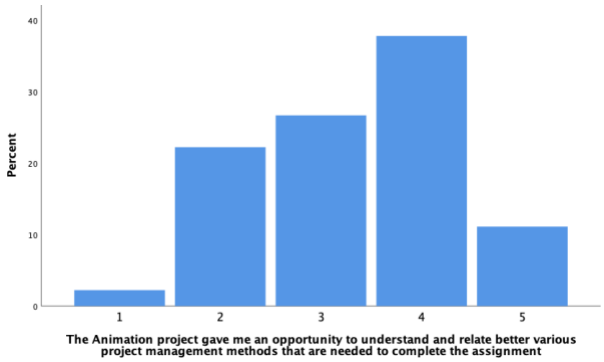

Figure 4. The distribution of student response to OB3

The results of the statistical tests show strong support for OB5 as shown in Figure 5. Results shows that 49% of students either Agree or Strongly agree while only 24.4% Disagree to the statement. This result may affirm that the animation project did not only contribute to gaining better management concepts but it helped students gaining better understanding of real-life challenges and insights.

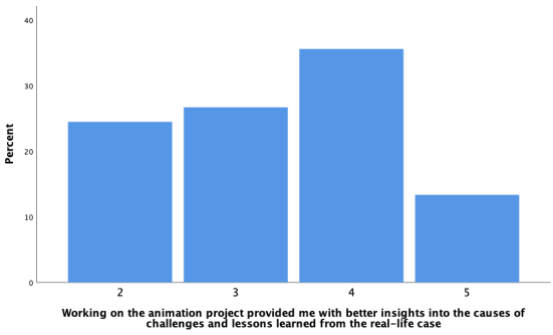

Figure 5. The distribution of student response to OB5

Post-print version of the paper by Hussein et al. In proceedings of 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS), Metz, France, 2019, pp. 933-937. **DOI:** 10.1109/IDAACS.2019.8924296

Finally, student evaluation shows no support to OB4 that Students will be managing their projects better in the future because of the experiences they gained from working on the animation project as shown in Figure 6. This objective was perhaps too optimistic or that the assignment should be slightly adapted in order to ensure that the knowledge and skills obtained through the assignment are transferable to other projects.

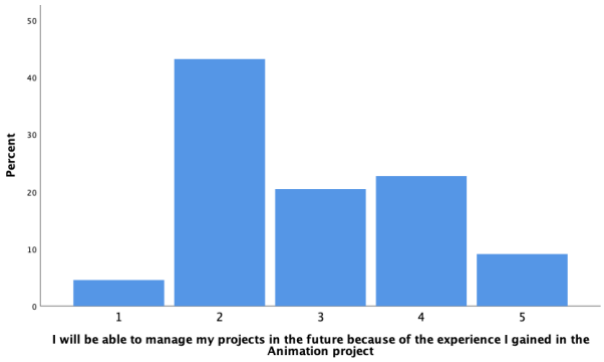

Figure 6. The distribution of student response to OB4

VI. CONCLUSIONS

The paper presented an example of a project-based learning that has been implemented in an introductory course in project management. The assignment provides a real-life challenge and not only an academic challenge. We believe that the case covered in this paper is different because it has been developed with the primary objective of involving students to produce usable learning aids in project management. The evaluation of the objectives of the Animation project was conducted using anonymous questionnaire and the results have shown the following results:

- The Animation Project has slightly managed to encapsulate the entire project life cycle. However, more efforts are needed from the course supervisor in order to help students to connect the knowledge they gain while they are working on the project with the generic project life cycle.
- The Animation Project proved to be an excellent approach to provide students with a learning environment that helps them to gain insights and lessons learned from real life project cases. The Project has as well provided students with an alternative approach to relate better and understand various project management concepts.
- The results show good support for the argument that involving students in producing learning aids in project management contributes positively to motivation among students.
- From the students viepoint, the results show that the experience gained from Animation project might not be useful in their future projects. This objective was perhaps too optimistic or that the assignment should be slightly adapted in order to ensure that the knowledge and skills obtained through the assignment are transferable to other projects.

REFERENCES

[1] T. Mengel, "Outcome-based project management education for emerging leaders – A case study of teaching and learning project management," *International Journal of Project Management*, vol. 26, pp. 275–285,2008.

[2] J. Thomas and T. Mengel, "Preparing project managers to deal with complexity - Advanced project management education," *International Journal of Project Management*, vol. 26, p. 304—315,2008.

[3] M. Winter, C. Smith, P. Morris, and S. Cicmil, "Directions for future research in project management: The main findings of a UK government-funded research network," *International Journal of Project Management*, vol. 24, p. 638—649,2006.

[4] G. Silvius and R. Schipper, "Exploring Responsible Project Management Education," *Education Sciences*, vol. 9, p. 2,2019.

[5] S. Cicmil and H. Gaggiotti, "Responsible forms of project management education: Theoretical plurality and reflective pedagogies," *International Journal of Project Management*, vol. 36, pp. 208-218,2018.

[6] B. Hussein, "A Blended Learning Approach to Teaching Project Management: A Model for Active Participation and Involvement: Insights from Norway," *Education Sciences*, vol. 5, pp. 104–125,2015.

[7] D. B. Geist and M. E. Myers, "Pedagogy and project management: should you practice what you preach," *Comput. Small Coll*, vol. 23, pp. 202–208,2007.

[8] C. Berggren and J. Soderlund, "Rethinking project management education: Social twists and knowledge co-production," *International Journal of Project Management*, vol. 26, p. 286—296,2008.

[9] U. Ojiako, M. Ashleigh, M. Chipulu, and S. Maguire, "Learning and teaching challenges in project management," *International Journal of Project Management*, vol. 29, pp. 268-278,2011.

[10] J.-R. Córdoba and A. Piki, "Facilitating project management education through groups as systems," *International Journal of Project Management*, vol. 30, p. 83—93,2012.

[11] J. L. Cano and I. Lidón, "Guided reflection on project definition," *International Journal of Project Management*, vol. 29, pp. 525–536,2011.

[12] A. Keegan and J. R. Turner, "Quantity versus quality in project-based learning practices," *Management learning*, vol. 32, pp. 77–98,2001.

[13] T. A. B. Galvao, F. M. M. Neto, M. F. Bonates, and M. T. Campos, "A Serious Game for Supporting Training in Risk Management through Project-Based Learning," in *Virtual and Networked Organizations, Emergent Technologies, and Tools*. vol. 248, G. D. Putnik and M. M. CruzCunha, Eds., ed, 2012, pp. 52–61.

[14] J. W. Thomas, "A review of research on project-based learning," 2000.

[15] M. Prince, "Does Active Learning Work? A Review of the Research," *Journal of Engineering Education*, vol. 93, pp. 223-231,2004.

[16] B. Hussein, *The Road to Success: Narratives and Insights from Real-Life Projects*: Fagbokforlaget, 2018.

[17] R. Gordon, "Balancing real-world problems with real-world results," *Phi Delta Kappan*, vol. 79, p. 390,1998.

[18] E. Bravo, B. Amante, P. Simo, M. Enache, and V. Fernandez, "Video as a new teaching tool to increase student motivation," in *IEEE Global Engineering Education Conference (EDUCON)*, Santa Cruz de Tenerife, Canary Islands, Spain, 2011, pp. 638-642.

[19] E. Cruse, "Using educational video in the classroom: Theory, research and practice," *Library Video Company*, 2006.

[20] P. C. Blumenfeld, E. Soloway, R. W. Marx, J. S. Krajcik, M. Guzdial, and A. Palincsar, "Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning," *Educational Psychologist*, vol. 26, pp. 369-398,1991.

[21] M. Scardamalia and C. Bereiter, "Schools as knowledge-building organizations," *Today's children, tomorrow's society: The developmental health and wealth of nations*, pp. 274-289,1999.